Statement of Basis

Title V Air Quality Permit

NorthWestern Energy
Highmore, South Dakota

South Dakota Department of Environment and Natural Resources

1.0 Background

On September 26, 2001, The South Dakota Department of Environment and Natural Resources (DENR) issued NorthWestern Energy formerly Northwestern Public Service Company its initial Title V air quality operating permit.

On March 12, 2004, DENR renewed NorthWestern Energy's Title V permit.

On November 26, 2008, the (DENR) received a notice of intent and application from Northwestern Energy located in Faulkton, South Dakota.

The primary Source Industrial Code (SIC) listed on the application for this facility was 4911 - establishments engaged in the generation, transmission, and/or distribution of electric energy for sale. NorthWestern's Highmore plant provides peak electrical generation. The facility is on call to operate, as needed, the diesel generator. The generator operates with distillate fuel as the fuel source.

2.0 Operational Description

Currently, the facility is permitted to operate three diesel engine generators. The following is a list of equipment and process that will be reviewed for the renewal application:

Renewal Application

1. Generator #1 – 1948 Fairbanks – Morse diesel engine - generator, model number 38D 8-1/8 / 889206. The diesel engine – generator is fired with distillate oil. The engine generator has a maximum design operating rate of 7 million Btus per hour heat input.
2. Generator #2 – 1960 Fairbanks – Morse diesel engine - generator, model number 38D 8-1/8 / 969513. The diesel engine – generator is fired with distillate oil. The engine generator has a maximum design operating rate of 13 million Btus per hour heat input.
3. Generator #3 – 1968 Fairbanks – Morse diesel engine - generator, model number 38TD 8-1/8. The diesel engine – generator is fired with distillate oil. The engine generator has a maximum design operating rate of 26.8 million Btus per hour heat input.
4. Tank #1 – 15,000 gallon vertical, above ground, storage tank. Distillate oil is stored in the tank
5. Tank #2 – 10,000 gallon vertical, above ground, storage tank. Distillate oil is stored in the tank.

3.0 Applicable Requirements

3.1 New Source Performance Standards

The department reviewed the New Source Performance Standards (NSPS) and determined that several NSPS need to be reviewed further to determine if they are applicable.

3.1.1 ARSD 74:36:07:88 – 40 CFR, Part 60, Subpart IIII

The department reviewed 40 CFR Part 60, Subpart IIII for applicability. Subpart IIII is applicable to owners and operators of stationary compression ignition (CI) internal combustion engines (ICE) that:

- Commence construction after July 11, 2005 where the stationary CI ICE are manufactured after April 1, 2006 and are not fire pump engines; or
- Modify or reconstruct their stationary CI ICE after July 11, 2005.

In accordance with 40 CFR §60.4219, a compression ignition means a type of stationary internal combustion engine that is not a spark ignition engine - an engine that combusts gasoline, natural gas or liquefied petroleum. NorthWestern Energy's generators are considered a compression ignition engine because the fuel source is diesel fuel. NorthWestern Energy's three generators were constructed in 1948, 1960 and 1968; prior to the 2005 applicability date. Therefore, Subpart IIII is not applicable.

3.1.2 ARSD 74:36:07:12 – 40 CFR, Part 60, Subpart K

The department determined that 40 CFR Part 60, Subpart K may be applicable.

ARSD 74:36:07:012 - 40 CFR, Part 60, Subpart K.

Subpart K- Standards of Performance for storage vessels of petroleum liquids constructed after June 11, 1973, and before May 19, 1978, is applicable to owners and operators of volatile organic liquid storage vessels that:

1. Construction, reconstruction, or modification commenced after June 11, 1973 and before May 19, 1978; and
2. The tank has a capacity greater than or equal to 151,412 liters (40,000 gallons) that is used to store volatile organic liquids.

The storage capacity of the distillate fuel storage tanks are: Tanks #1 - 15,000 gallons (56,376 liters) and Tank #2 - 10,000 gallons (37,854 liters), both of which are less than the 40,000 gallon minimum storage limit. . *Petroleum liquids* means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery but does not mean Nos. 2 through 6 fuel oils or diesel fuel oils Nos. 2–D and 4–D. NorthWestern Energy is storing distillate oil in the tank, which has a maximum true vapor pressure of 0.0048 pounds per square inch absolute (0.04

kilopascals). By definition, the tanks are not subject to the standards for petroleum liquid compounds. Tank #1 was constructed in 1960, prior to the 2005 applicability date. Therefore this subpart is not applicable to the storage tanks.

Subpart Ka - Standards of Performance for storage vessels of petroleum liquids constructed after May 18, 1978 and before July 24, 1984, is applicable to owners and operators of volatile liquid storage vessels that:

1. Construction, reconstruction, or modification commenced after May 18, 1978 and before July 24, 1984; and
2. The tank has a capacity greater than or equal to 151,416 liters (40,000 gallons) that is used to store volatile organic liquids.

The storage capacities of the distillate fuel storage tanks are 37,854 liters (10,000 gallons) and 56,781 liters (15,000 gallons) both of which are less than 151,416 liters. Subpart Ka defines petroleum liquids as those with a true vapor pressure equal to or greater than 10.3 kPa (1.5 psia) but not greater than 76.6 kPa (11.1 psia). NorthWestern Energy is storing distillate oil in the tanks, which has a maximum true vapor pressure of 0.0048 pounds per square inch absolute (0.04 kilopascals). Therefore this subpart is not applicable to the storage tanks.

ARSD 74:36:07:14 – 40 CFR, Part 60, Subpart Kb –

Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (including Petroleum Liquid Storage Vessels) for which Construction, Reconstruction, or Modification Commenced after July 23, 1984is applicable to owners and operators of volatile liquid storage vessels that:

1. Has a capacity greater than or equal to 75 cubic meters and used to store volatile organic liquids; and
2. Commenced construction, reconstruction, or modification after July 23, 1984.

The storage capacity of the distillate fuel storage Tank #1is 37.9 cubic meters (10,000 gallons). Tank #2 is 56.9 cubic meters (15,000 gallons), both are less than 75 cubic meters. Subpart Kb defines volatile organic liquids as those with a maximum true vapor pressure equal to or greater than 5.2 kPa but less than 76.6 kPa. The tanks are used to store distillate oil, which has a maximum true vapor pressure of 0.0048 pounds per square inch absolute (0.04 kilopascals) which does not meet the standards for volatile organic compounds. Therefore, this subpart is not applicable to the storage tanks.

NorthWestern Energy's application listed three other tanks:

- Tank #3 – 70 gallon tank constructed in 1960 used to store residual oil;
- Tank #4 – 860 gallon tank constructed in 1960 used to store distillate oil and
- Tank #5 – 500 gallon tank constructed in 1948 used to store distillate oil.

Tanks #3-5 were all constructed prior to the applicability dates in Subparts K through Kb, and are less than the minimum storage volume of 37.9 cubic meters (10,000 gallons). These tanks will be considered insignificant activities and not included in the permitted sources.

3.2 New Source Review

ARSD 74:36:10:01 states that New Source Review (NSR) regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. NorthWestern Energy's facility is located in Highmore, South Dakota, which is in attainment or unclassifiable for all the pollutants regulated under the Clean Air Act. Therefore, NorthWestern Energy is not subject to NSR review.

3.3 Prevention of Significant Deterioration

Any stationary source which emits, or has the potential to emit, 250 tons per year or more of any regulated NSR air pollutant is considered a major source and subject to prevention of significant deterioration (PSD) requirements under ARSD 74:36:09 – 40 CFR §52.21(b)(1). Any stationary source which emits or has the potential to emit 100 tons per year or more of any regulated NSR air pollutant and is subject to one of the 28 named PSD source categories is subject to PSD requirements in ARSD 74:36:09 – 40 CFR §52.21(b)(1).

3.3.1 Emission Factors

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) and Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017) documents, the applicant's application, or other methods to determine potential air emissions.

Uncontrolled emission factors for the generators fueled with distillate oil were derived from AP-42, Tables 3.4-1 through 3.4-3 (10/96). The emission factors for the generators are summarized in Table 3.3.

3.3.1-1 Diesel engine - generator

The maximum generating capacity of the diesel engine is 2,750 kilowatts (approximately 4,000 horsepower). A generator with a capacity greater than 600 horsepower is defined as a large diesel generator. The diesel engine – generator is defined as a large diesel generator because its maximum generating capacity is greater than 600 horsepower.

The emission factors are derived from AP-42 Tables 3.4-1, 3.4-3, and 3.4-4 (10/96) for Large Stationary Diesel And All Stationary Dual-fuel Engines. The sulfur dioxide emission rate is based on sulfur content in the distillate oil less than 0.28 weight percent.

TSP	= 0.0697 pounds per MMBtu
PM10	= 0.0573 pounds per MMBtu
SO_2	= 1.01 x S_1 pounds per MMBtu; where S_1 = weight percent sulfur in distillate oil
	= 1.01 x 0.28 pounds per MMBtu
	= 0.28 pounds per MMBtu
NOx	= 3.2 pounds per MMBtu
VOC	= 0.082 pounds per MMBtu
CO	= 0.85 pounds per MMBtu
HAPs	= 0.00156 pounds per MMBtu

3.3.1-2 Tanks

The emissions factors for the tanks are derived from computer software program Tanks 4.0.

3.3.2 Potential Emission Calculations

Potential emissions for each applicable pollutant are calculated from the maximum design capacity listed in the application and assuming the unit operates every hour of every day of the year. NorthWestern Energy does not have control equipment associated with the diesel engine - generator; therefore, the potential uncontrolled and controlled emissions are the same.

The calculations for the potential emissions for the tanks are in Appendix A. Table #1 provides a summary of the potential emissions

Annual potential emissions for each applicable pollutant are calculated from the maximum design capacity listed in the application, assuming the unit operates every hour of every day of the year or 8,760 hours per year, and the emission factors found in Table 3.3.

Equation 3.1, the maximum designed operating rate in kilowatts, an efficiency of 35%, and a conversion factor of 3,413 Btus per kilowatt-hour were used to calculate the maximum designed operating rate based on heat input of the generator in million Btus (MMBtus) per hour.

Equation 3.1 – Heat Input Calculation

$$HeatInput\left[\frac{MMBtus}{hr}\right] = \left(\frac{OperatingRate[kW] \times 3{,}413\left[\frac{Btu}{hr \times kW}\right]}{10^6\left[\frac{Btu}{MMBtu}\right] \times 35\%}\right)$$

The maximum designed heat input for generators #1-#3 is 7.0, 13.0 and 27.0 MMBtu per hour, repectively.

Equation 3.2 – Potential Emission Calculations for Distillate Oil

$$Potential\ \ Emissions\left[\frac{tons}{year}\right]=\left(\frac{Emission\ \ Factor\left[\frac{pounds}{MMBTU}\right]\times Annual\ \ Operations\left[\frac{hr}{year}\right]\times HeatInput\left[\frac{MMBtu}{hr}\right]}{2000\left[\frac{pounds}{tons}\right]}\right)$$

Table #1
Potential Emissions

Description	TSP (tons/yr)	PM10 (tons/yr)	SO_2 (tons/yr)	NO_X (tons/yr)	VOC (tons/yr)	HAPs (tons/yr)	CO (tons/yr)
Generator #1	8.2	6.8	33.1	378.4	9.7	0.2	100.5
Tank #1	-	-	-	-	0.24	-	-
Tank #2	-	-	-	-	0.24	-	-
Total Emissions	**8**	**7**	**33**	**378**	**10.2**	**0**	**100**

The HAP total does not need to be broken down into individual HAP components because the total HAPs were less than the individual threshold limit of 10 tons per year.

Tanks have the potential to emit VOCs and HAPs. The potential emissions from the tank were calculated using TANKS 4.0 program and the results are attached in Appendix A. Table 3.5 summarizes the potential emissions from the tank.

Table 3.5 – Potential Emissions from Tank

Pollutant	TSP/PM10	SO_2	NO_x	CO	VOCs	HAPs
Tank #1	0.0	0.0	0.0	0.0	0.24	0.0
Tank #2	0.0	0.0	0.0	0.0	0.24	0.0

The emissions from the tanks are considered negligible.

3.3.3 PSD Applicability

Any stationary source which constructed or modified after August 7, 1977 and emits or has the potential to emit 250 tons per year or more of any air pollutant is subject to Prevention of Significant Deterioration (PSD) requirements *(ARSD 74:36:09 – 40 C.F.R. Part 52.21(b)(1)).* Any stationary source which emits, or has the potential to emit, 100 tons per year or more of any air pollutant and is subject to one of the 28 named PSD source categories is subject to PSD requirements *(ARSD 74:36:09 – 40 C.F.R. Part 52.21(b)(1)).*

NorthWestern Energy is not one of the 28 named PSD source categories but does have the potential nitrogen oxide emissions greater than 250 tons per year threshold. Therefore, NorthWestern Energy is considered a major source under the PSD program. Since NorthWestern Energy was constructed in 1969, which is prior to August 7, 1977, NorthWestern Energy has not been required to obtain a PSD permit. However, any modification that occurs at this facility must be reviewed to determine if it is considered a major modification under the PSD program.

3.4 National Emissions Standards for Hazardous Air Pollutants

The department reviewed the Maximum Achievable Control Technology (MACT) standards and determined that one MACT standard needs to be reviewed further to determine if it is applicable.

40 CFR Part 63, Subpart ZZZZ is subject to owners or operators of a stationary Reciprocating Combustion Engine (RICE) at a major and area source of HAP emissions. Stationary RICE is any internal combustion engine which uses reciprocating motion to convert heat energy into mechanical work and which is not mobile. A major source of HAP emissions is a plant site that emits or has the potential to emit any single HAP at a rate of 10 tons or more per year or any combination of HAP at a rate of 25 tons or more per year.

NorthWestern Energy is not a major source of HAP; however NorthWestern Energy is an area source of HAP. As noted in 40 CFR §63.6590(a)(2)(iii) a new stationary RICE is a stationary RICE located at an area source of HAP emissions is new if construction of the stationary RICE began on or after June 12, 2006.

NorthWestern Energy's generator were installed in 1948, 1960 and 1968; therefore, this subpart is not applicable.

3.5 State Requirements

3.5.1 State Emission Limits

Total suspended particulate and sulfur dioxide emission limits are applicable to fuel burning units. NorthWestern Energy's operations involve fuel burning units. The total suspended particulate and sulfur dioxide emission limits for fuel burning units are derived from ARSD 74:36:06:02.

Tables #2 and #3 compare the potential emission rates to the allowable emission limits for particulate and sulfur dioxide, respectively.

Table #2
Particulate (TSP) Comparison

Unit	Distillate Oil Potential Rate	Particulate Limit
Diesel Generator	0.0697 lbs/MMBtu	0.53 lbs/MMBtu

Table #3
Sulfur Dioxide Comparison

Unit	Distillate Oil Potential Rate	Sulfur Dioxide Limit
Diesel Generator	0.28 lbs/MMBtus	3 lbs/MMBtu

3.5.2 State Restrictions on Visible Emissions

Visible emissions are applicable to any unit that discharges to the ambient air. In accordance with ARSD 74:36:12, a facility may not discharge into the ambient air more than 20 percent opacity for all units. NorthWestern Energy must control the opacity at less than 20 percent for the generator.

3.5.3 Insignificant Activities

In accordance with ARSD 74:36:05:04.01(7), any unit that has the potential to emit two tons or less per year of any criteria pollutant before the application of control equipment is considered an insignificant activity and is exempt from inclusion in the Title V air quality operating permit. Tanks #1 and #2 have the potential to emit less than 2 tons per year. Therefore both tanks are considered insignificant activities.

3.5.4 Air Fees

Title V sources are subject to an annual air quality fee. The fee consists of an administrative fee and a per ton fee based on the actual tons per year of pollutant emitted. The pollutants that are charged are particulate matter, sulfur dioxides, nitrogen oxides, volatile organic compounds and hazardous air pollutants. Presently, the air emission fee is $6.10 per ton of pollutant actually emitted. The actual emissions are calculated by the department and are based on information provided by the source.

NorthWestern Energy will be required to operate within the requirements stipulated in the following regulations:

3.6 Summary of Applicable Requirements

ARSD 74:36:05 - Operating Permits for Part 70 Sources;

ARSD 74:36:06 - Regulated Air Pollutant Emissions;
ARSD 74:36:11 - Performance Testing;
ARSD 74:36:12 - Control of Visible Emissions; and
ARSD 74:37:01 - Air Pollution Control Program Fees.

4.0 Title V Air Quality Permit

Any source operating in South Dakota that meets the definition of ARSD 74:36:05:03 is required to obtain a Title V air quality permit. A Title V air quality permit is required if a source has the potential to emit more than 100 tons of a criteria pollutant (nitrogen oxide, volatile organic compounds, PM10, carbon monoxide, lead and ozone), has the potential to emit more than 10 tons of a single hazardous air pollutant, has the potential to emit more than 25 tons of any combination of a hazardous air pollutants, or is applicable to a New Source Performance Standard or a MACT standard.

NorthWestern Energy's diesel generators have the potential to emit more than 250 tons of any one pollutant, i.e. NOx. The potential emissions from the tanks are less than 2.5 tons per year. In accordance with ARSD 74:36:05:04:01, a unit with the potential to emit less than two tons or less per year before considering controls is exempt from being included in a Title V air quality permit and are considered insignificant activities. Table 4.1 summarizes the permitted unit (s).

Table 4.1 Description of Permitted Units, Operations, and Processes

Identification	Description	Maximum Operating Rate	Control Device
Unit #1	1969 Fairbanks – Morse diesel engine - generator, model number 38TD / 868053. The generator is fired on distillate oil.	2,750 kilowatts heat output or 27 million Btus per hour heat input	Not applicable
Unit #2			
Unit #3			

4.1 Compliance Assurance Monitoring (CAM)

Compliance assurance monitoring is applicable to permit applications received on or after April 20, 1998, from major sources applying for a Title V permit. NorthWestern Energy's renewal application was received on March 1, 2001. Therefore, compliance assurance monitoring is applicable to any unit that meets the following criteria:

1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;

2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

NorthWestern Energy does not use a control device to achieve compliance with applicable requirements. Therefore, compliance assurance monitoring is not applicable to NorthWestern Energy.

4.2 Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to Title V of the federal Clean Air Act. NorthWestern Energy is required to meet opacity, particulate and sulfur dioxide emission limits.

Periodic monitoring for the opacity and particulate emission limits may consist of visible emission readings, stack tests, pressure drop readings for the appropriate control device, implementation of a maintenance plan for the appropriate control device, etc. NorthWestern Energy typically operates the diesel engine – generator less than 100 hours in a calendar year. Therefore, stack testing is not considered economical. NorthWestern Energy will be required to perform periodic visible emission readings when the unit is in operation to ensure the unit can meet its opacity and particulate emission limits. The permit contains sufficient language which allows the department to require NorthWestern Energy to conduct a stack test if visible emission readings or hours of operation warrant a stack test.

Periodic monitoring for sulfur dioxide shall be based on the sulfur content of the distillate oil fired in the engine – generator.

5.0 Recommendation

Based on the information submitted in the air quality permit application, the department recommends approval of a Title V air quality permit for NorthWestern Energy facility in Faulkton, South Dakota. Questions regarding this permit review should be directed to Keith Gestring, Natural Resources Project Engineer, Air Quality Program.

Appendix A

Potential Emission Calculations

NorthWestern Energy -- Highmore

Diesel Engine -- Generator #1 (1947)

Given information		Emission Factor			Emission Calculations		
					Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	2.01	tons TSP/year
6.6	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	1.66	tons PM-10/year
		SO_2	0.505	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	14.60	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	92.51	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	2.37	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.05	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	24.57	tons CO/year
The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.							
675	kilowatts	6.58221	MMBtu/hour		(675 kilowatts) x (3413 Btu / hour - killowatts) / (1000000 Btus/MMBtu) / (0.35%)		
35%	Efficiency						

Diesel Engine -- Generator #2 (1960)

Given information		Emission Factor			Emission Calculations		
					Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	4.06	tons TSP/year
13.3	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	3.34	tons PM-10/year
		SO_2	0.505	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	29.42	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	186.41	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	4.78	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.09	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	49.52	tons CO/year
The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.							
1360	kilowatts	13.2619	MMBtu/hour		(1360 kilowatts) x (3413 Btu / hour - killowatts) / (1000000 Btus/MMBtu) / (0.35%)		
35%	Efficiency						

Diesel Engine -- Generator #3 (1971)							
Given information		Emission Factor			Emission Calculations		
					Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	8.18	tons TSP/year
26.8	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	6.73	tons PM-10/year
		SO_2	0.505	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	59.28	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	375.63	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	9.63	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.18	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	99.78	tons CO/year
The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.							
2750	kilowatts	26.8164	MMBtu/hour		(2750 kilowatts) x (3413 Btu / hour - killowatts) / (1000000 Btus/MMBtu) / (0.35%)		
35%	Efficiency						

Tanks 4.0
Emissions Report – Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification	Tank #2
City	Highmore
State	South Dakota
Company	NorthWestern Energy
Type of Tank	Vertical Fixed Roof Tank
Description	10,000 gallon distillate oil tank

Tank Dimensions

Shell Height (ft)	18.00
Diameter (ft)	10.00
Liquid Height (ft)	17.02
Avg. Liquid Height (ft)	10.00
Volume (gallons)	10,000.00
Turnovers	230.00
Net Throughput (gal/yr)	2,300,000.00
Is Tank Heated (y/n)	N

Paint Characteristics

Shell Color/Shade	White/White
Shell Condition	Good
Roof Color/Shade	White/White
Roof Condition	Good

Roof Characteristics

Type	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.00

Breather Vent Settings

Vacuum Settings (psig)	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Huron, South Dakota (Avg. Atmospheric Pressure = 14.05 psia)

Tanks 4.0
Emissions Report – Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf Temperature (deg F)			Liquid Bulk Temp. (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fraction	Vapor Mass Fraction	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max		Avg.	Min	Max					
Distillate fuel oil no. 2	All	46.92	41.13	52.70	45.20	0.0042	0.0034	0.0051	130.00			188.00	Option 5 A=12.101, B = 8907

Tanks 4.0
Emissions Report – Summary Format
Individual Tank Emission Totals

Components	Losses (lbs)		
	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	8.81	0.95	9.75

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	NWE Tank #1	
City:	Highmore	
State:	South Dakota	
Company:	NorthWestern Energy	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	15,000 gallon tank	
Tank Dimensions		
Shell Height (ft):		26.00
Diameter (ft):		10.00
Liquid Height (ft) :		25.53
Avg. Liquid Height (ft):		15.00
Volume (gallons):		15,000.00
Turnovers:		230.00
Net Throughput(gal/yr):		3,450,000.00
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		0.00
Slope (ft/ft) (Cone Roof)		0.00
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Huron, South Dakota (Avg Atmospheric Pressure = 14.05 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

NWE Tank #1 - Vertical Fixed Roof Tank
Highmore, South Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	46.92	41.13	52.70	45.20	0.0041	0.0033	0.0050	130.0000			188.00	Option 1: VP40 = .0031 VP50 = .0045

TANKS 4.0.9d

Emissions Report - Detail Format

Detail Calculations (AP-42)

NWE Tank #1 - Vertical Fixed Roof Tank
Highmore, South Dakota

Annual Emission Calcaulations	
Standing Losses (lb):	1.2717
Vapor Space Volume (cu ft):	863.9380
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0416
Vented Vapor Saturation Factor:	0.9976
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	863.9380
Tank Diameter (ft):	10.0000
Vapor Space Outage (ft):	11.0000
Tank Shell Height (ft):	26.0000
Average Liquid Height (ft):	15.0000
Roof Outage (ft):	0.0000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.0000
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0000
Shell Radius (ft):	5.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0041
Daily Avg. Liquid Surface Temp. (deg. R):	506.5856
Daily Average Ambient Temp. (deg. F):	45.1792
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	504.8692
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,284.6262
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0416
Daily Vapor Temperature Range (deg. R):	23.1488
Daily Vapor Pressure Range (psia):	0.0018
Breather Vent Press. Setting Range(psia):	0.0600

Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0041
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0033
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0050
Daily Avg. Liquid Surface Temp. (deg R):	506.5856
Daily Min. Liquid Surface Temp. (deg R):	500.7984
Daily Max. Liquid Surface Temp. (deg R):	512.3728
Daily Ambient Temp. Range (deg. R):	23.6583
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9976
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0041
Vapor Space Outage (ft):	11.0000
Working Losses (lb):	12.9068
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0041
Annual Net Throughput (gal/yr.):	3,450,000.0000
Annual Turnovers:	230.0000
Turnover Factor:	0.2971
Maximum Liquid Volume (gal):	15,000.0000
Maximum Liquid Height (ft):	25.5310
Tank Diameter (ft):	10.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	14.1785

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

NWE Tank #1 - Vertical Fixed Roof Tank
Highmore, South Dakota

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	12.91	1.27	14.18

Appendix B

Emission Limit Calculations

Particulate Limit Derivation		
Diesel Engine - Generator #1		
Heat Capacity =	6.6	
The following calculation was performed to determine the particulate limit for the unit		
Particulate Limit Formula -- ARSD 74:36:06:02 1(a)		
E = 0.6 pounds per million Btus of heat input		
E =	**0.63**	**pounds per million Btus of heat input**
or	**3.96**	**pounds per hour**
Diesel Engine - Generator #2		
Heat Capacity =	13.3	million Btus per hour heat input
The following calculation was performed to determine the particulate limit for the unit		
Particulate Limit Formula -- ARSD 74:36:06:02 1(b)		
E = 0.811 x H-0.131		
where E = the rate of emission in pounds per million Btus of heat input		
H = heat input in millions of Btus per hour		
E = 0.811 x 13.3^-0.131		
E =	**0.578**	**pounds per million Btus of heat input**
or	**7.69**	**pounds per hour**
Diesel Engine - Generator #3		
Heat Capacity =	26.8	million Btus per hour heat input
The following calculation was performed to determine the particulate limit for the unit		
Particulate Limit Formula -- ARSD 74:36:06:02 1(b)		
E = 0.811 x H-0.131		
where E = the rate of emission in pounds per million Btus of heat input		
H = heat input in millions of Btus per hour		
E = 0.811 x 26.8^-0.131		
E =	**0.527**	**pounds per million Btus of heat input**
or	**14.13**	**pounds per hour**

Sulfur Dioxide Limit Derivation		
Diesel Engine - Generator #1		
Heat Capacity =	6.6	million Btus per hour heat input
The following calculation was performed to determine the sulfur dioxide limit for the unit		
Sulfur Dioxide Limit Formula -- ARSD 74:36:06:02 2		
Emission Limit = 3 pounds per million Btus of heat input		
Diesel Engine - Generator #2		
Heat Capacity =	13.3	million Btus per hour heat input
The following calculation was performed to determine the sulfur dioxide limit for the unit		
Sulfur Dioxide Limit Formula -- ARSD 74:36:06:02 2		
Emission Limit = 3 pounds per million Btus of heat input		
Diesel Engine - Generator #3		
Heat Capacity =	26.8	million Btus per hour heat input
The following calculation was performed to determine the sulfur dioxide limit for the unit		
Sulfur Dioxide Limit Formula -- ARSD 74:36:06:02 2		
Emission Limit = 3 pounds per million Btus of heat input		

Diesel Engine -- Generator #1 (1947)							
Given information		Emission Factor			Emission Calculations		
					Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	2.01	tons TSP/year
6.6	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	1.66	tons PM-10/year
		SO_2	0.28	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	8.09	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	92.5	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	2.37	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.05	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	24.57	tons CO/year
The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.							
675	kilowatts	26.8164	MMBtu/hour		(675 kilowatts) x (3413 Btu / hour - killowatts) / (1000000 Btus/MMBtu) / (0.35%)		
35%	Efficiency						

Diesel Engine -- Generator #2 (1960)							
Given information		Emission Factor			Emission Calculations		
					Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	4.06	tons TSP/year
13.3	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	3.34	tons PM-10/year
		SO_2	0.28	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	16.31	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	186.41	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	4.78	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.09	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	49.52	tons CO/year
The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.							
1360	kilowatts	26.8164	MMBtu/hour		(1360 kilowatts) x (3413 Btu / hour - killowatts) / (1000000 Btus/MMBtu) / (0.35%)		
35%	Efficiency						

Diesel Engine -- Generator #3 (1968)							
Given information		Emission Factor			Emission Calculations		
					Formula	Annual Emissions	
Heat Capacity		TSP	0.0697	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	8.18	tons TSP/year
26.8	MMBtu/hour	PM-10	0.0573	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	6.73	tons PM-10/year
		SO_2	0.28	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	32.87	tons SO_2/year
Potential Operating		NO_X	3.2	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	375.63	tons NO_X/year
8760	hours/year	VOC	0.082	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	9.63	tons VOC/year
		HAP	0.00156	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.18	tons HAP/year
		CO	0.85	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	99.78	tons CO/year
The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 2750 kilowatts and an estimated operating efficiency of 35%.							
2750	kilowatts	26.8164	MMBtu/hour		(2750 kilowatts) x (3413 Btu / hour - killowatts) / (1000000 Btus/MMBtu) / (0.35%)		
35%	Efficiency						

Appendix A
TANKS 4.0 Results